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# A Partial Solution to the Financial Risk and Perverse Response Problems of Labour-Managed Firms: Industry-Average Performance Bonds

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**Abstract**

A serious problem with financing labour-managed or employee owned firms with standard performance bonds is that workers would have an incentive to make investments which do not add to value added but which do increase workers utilities. To avoid such problems it is necessary to design an asset which bears some of the risk which is out of the control of workers, but which makes payments which they cannot affect. In this paper such an asset is proposed, termed **Industry-Average Performance Bonds**. Each bond pays a fixed share of value added by other firms in the same industry. Since the payment depends only on the value added by other firms in the same industry, workers have no interest in reducing their liability by reducing value added. This asset would enable investors to sell insurance against general and industry specific risk to labour managed or fully employee owned firms. Use of the bonds would mitigate the well-known perverse supply responses of such firms by reducing the variance of economic rent.

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I. INTRODUCTION AND OVERVIEW

In recent years there has been an enormous expansion of partial or full employee ownership of firms in Europe and North America. In Europe, the number of employees in fully worker owned firms doubled in the late 1970s and early and mid 1980s (Estrin, 1985), and slower but steady growth has continued since. Some 10 million employees are now enrolled in employee stock ownership plans (ESOPs) in over 10,000 companies in the United States. About one-third are expected to be ultimately fully or majority employee-owned (GAO, 1987). The increase in these numbers has dramatically accelerated in 1988 and 1989.[1] Growth of labour-managed firms (LMFs), including producer cooperatives, is likely to be fueled by higher measured productivity in at least some industries (Conte and Svejnar, 1988; Blinder, ed., 1990). Worker ownership is growing dramatically in Eastern Europe, where privatization to employees are common.[2]

Economists have concerns about the wisdom of including privatization to employees as a component of economic reform (e.g., Lipton and Sachs, 1990). In particular, unsolved dilemmas of financing may be constraining further movement in this direction. If employee control follows from full or majority (or even minority) employee ownership, outside investors will presumably be willing to bear any part of the firm's risk only at a high premium at best. Without control over management directly or through the threat of takeovers, investors might reasonably fear that employees will take profits in pay raises and avoid paying an adequate return on shares. Currently, fully employee owned firms have only a few options for raising capital,

each of which distorts choices about investment and employment. They might invest out of their own income, foregoing outside funding and keeping the full stream of value added. This requires a very high rate of saving, especially for capital intensive firms; and in particular, this solution requires that new workers buy the firm from current and retired workers by accepting low wages or perhaps by making large up-front investments. The resulting differentials in net remuneration, while not necessarily greater than that found in investor owned firms, might damage the morale of this type of firm, undermining its sources of organizational comparative advantage. The need to buy shares discourages liquidity-constrained (e.g. unemployed) workers from joining and in a number of cases in the U.S., this has led firms to revert to a conventional structure (e.g., purchase by a conventional firm). Alternatively, current workers could give shares to new workers. This would discourage investment, shorten the planning horizon, and reduce employment. This is the second problem, often considered in the LMF literature (Vanek, 1970), the difficulty of hiring new workers when the value of the workers share in the firm is positive. Finally, there is the traditional concern that employees in labour-managed firms where nonmember labour is prevented will have an incentive to decrease employment when output price rises.

The currently available alternative is for LMFs to issue bonds, keeping only some of value added but bearing all of the risk. This does not directly require high saving, but the average but uneven income stream would require high personal saving as an insurance device. The net value of the firm can be reduced to

zero, eliminating distortions in hiring and investment. Unfortunately, the value of such a risky job might be less than the value of an ordinary job.

Proposed new forms of funding for labour-managed firms or LMFs are designed to make it possible for investors to share the risk, without giving workers incentives to cheat investors or compromising the essential character of the LMF. The leading such proposal is the issue of performance bonds (often termed "risk participation bonds") which pay a fixed share of value added by the firm. This implies that outside investors and worker-owners divide value added in fixed shares. Since they receive the same payments, they have similar interests so investors could allow workers to manage the firm. The workers could reduce their share until their job had a value close to the alternative wage, and employ new workers without requiring them to pay for their share(s). Retired workers could keep their shares or sell them back to the firm (or where permitted) to investors to avoid bearing new risk. With such a system, the efficient level of employment and investment may obtain (e.g., McCain, 1977).

A serious problem with financing with performance bonds is that workers would have an incentive to make investments which do not add to value added but which do increase workers utilities, for example "gold-plated" purchases to make their jobs more pleasant, such as fancy offices, luxury furniture in factories, and elegant restaurants, or simply to shirk. All these are problems for conventional firms as well, but can be limited by shareholders' legal authority and especially by the

threat of takeovers. To avoid such problems it is necessary to design an asset which bears some of the risk which is out of the control of workers, but which makes payments which they cannot affect.

An approach based on the principal/agent and utility regulation literatures is to make the payments on the bonds depend on the performance of different firms in the same industry (Holmstrom, (1979, 1982); Green and Stokey (1983); Lazear and Rosen, 1981)). For example Gibbons and Murphy (1989) has analyzed managerial evaluations based on the performance of other managers in the principal agent framework (See also Antle and Smith (1986)). Shleifer (1985) considered the problem in electric utility regulation that marginal cost pricing will damage the company's incentive to innovate, and proposes that prices be set equal to average marginal costs across a basket of utilities as an alternative. Although one does receive a return from the "gold-plating" of other utilities, one does not receive a return from ones own gold-plating, so that each does not gold-plate so long as collusion is excluded.

A general solution is an asset we call Industry-Average Performance Bonds. The proposed asset could be implemented even if there were a large number of LMFs. Each bond would pay a fixed share of value added by other firms in the same industry.[3] It would be bought at the market rate, which would include where relevant a default premium. Since the payment would depend only on the value added by other firms in the same industry, workers would have no interest in reducing their liability by reducing value added.

This asset would enable investors to sell insurance against general and industry-specific risk to LMFs. Of course the workers would still bear firm-specific risk, but this is necessary to provide incentives for efficiency and to prevent legal embezzlement.

If LMFs were financed with the proposed asset and maximized the utility of their members they would invest and work at efficient levels. If they were exactly as efficient as publicly traded firms the net value of the LMFs would be zero so there would be no need for workers to buy jobs to avoid distortion of employment decisions. If LMFs were more efficient than conventional firms, then jobs in LMFs would be valuable. If the efficiency gain were proportional to employment, employment decisions would still not be distorted even if new employees were not required to buy their jobs.

If allowed to do so, LMFs would choose to issue more industry performance bonds than they require to finance investment and would invest part of the proceeds in regular bonds. If there is a risk neutral investor, they can, in effect, buy insurance against firm non-specific risk at no cost.[4] This will not reduce the return on industry performance bonds if investors anticipate that they will do so. Since the payment owed by a given firm does not depend on their investment or value added this does not present a moral hazard problem unless firms collude.

The following two sections present a simple model which substantiates the above claims.

## II. Certainty

Assume a continuum of LMFs indexed by i which ranges from 0 to 1. Each produces the same good with the same production function given by (1), where $q_i$ is the output of firm i, $L_i$ is (homogeneous) employment in firm i, and $K_i$ is the capital used by firm i.

(1) $Q_i = F(L_i, K_i)$.

Variables without subscripts refer to industry totals. The price of the good is normalized to 1. The model has two periods. Workers have alternative employment opportunities (say in conventional, wage-paying firms) of value w. Firm i issues an asset which pays a share $D_i$ of value added in the industry. Investors require an expected return of r so the asset issued by firm i sells for $D_iPQ/(1+r)$. Note Q has no subscript and refers to the industry average. The firm invests this so

(2) $K_i = D_iQ/(1+r)$.

The workers divide the remainder so each worker receives a share given by:

(3) $S_i = (F(L_i, K_i) - D_iF(K,L))/L_i$

plugging (2) into (3) gives

(4) $S_i = (F(L_i, D_iF(K,L)/(1+r)) - D_iF(K,L))/L_i$

The LMF is assumed to choose $D_1$ and $L_1$ to maximize $S_1$ subject to the constraint that $S_1$ is greater than or equal to w. This maximization is undertaken by a manager, union, some number of initial members or other agent, at the start of the period, but assuming that the return, $S_1$, is equal for all homogeneous employees. This assumption is maintained for simplicity but also to make the efficiency problem for the worker-owned firm more difficult, since it is well-known that worker-owned firms choose employment levels efficiently when allowed to vary the dividend share for otherwise equally-skilled workers depending only on how late they arrived in the established firm (Meade, 1986).

It is clear that the LMF will chose $D_1$ to fund the optimal capital stock without requiring any additional saving from their members. The first order condition for $D_1$ is

$$(5) \quad 0 = F_K(L_1,K_1)F(K,L)/(1+r) - F(K,L).$$

So $F_K = (1+r)$, just as it would be for an efficient profit maximizing firm.

The first order condition for L is given by:

$$(6) \quad 0 \leq F_L(L_1,K_1)L_1 - F(L_1,K_1) + (1+r)K_1)/L^2$$

which holds with equality if $S_1 > w$. Together, (5) and (6) imply

$$(7) \quad F_L(L_1,K_1)L_1 + F_K(L_1,K_1)K_1 = F(L_1,K_1)$$

This is exactly the familiar long-run condition for equilibrium

in the labour-managed firm (Vanek, 1970; Ireland and Law, 1982; Smith and Ye, 1988). For if initially producing at any point beyond that of constant returns to scale, the dividend could be raised by decreasing the number of dividend-accruing employees.

## III. Risk Resolved After Employment Decisions Are Made

The advantage of industry performance bonds over ordinary bonds is that it enables LMFs to avoid bearing firm non-specific risk. This is clearly desirable if there are any investors who are willing to bear some of the risk, and in particular if the risk is industry-specific and diversifiable. For simplicity we will assume that there is a risk neutral investor or equivalently that the risk shared by the LMFs in the model is completely industry specific and diversifiable. We will also assume that workers maximize a mean-variance utility function of income of the form in (8):

$$(8)\quad V_i = E(S_i) - g^{*}\mathrm{var}(S_i)$$

The form of risk considered is variance in price which is assumed to include a firm specific ($e_i$) and a firm non-specific (u) component. Equation (9) replaces equation (1):

$$(9)\quad P_iQ_i = (1 + e_i + u)F(L_i,K_i)$$

where the variance of $e_i$ is $\sigma_e^2$ and the variance of u is $\sigma_u^2$.

With a range over which constant returns to scale holds, the level of labour demanded by the LMF is not determined in partial equilibrium. The only variable which can be calculated is the capital labour ratio. To simplify the equations we introduce intensive notation $f(k_1) \equiv f(K_1/L_1) \equiv F(L_1,K_1)/L_1$. If there is a risk neutral investor, the socially optimal capital labour ratio gives $f'(k_1) \equiv F_K(L_1,K_1) = (1+r)$. The fact that the pure LMF must bear firm specific risk implies that it will invest less than is socially optimal. If it bears all such risk it will invest still less. A reduction in the capital labour ratio due to risk has been noted in the literature (see Hey 1981 and references therein).

If employee owned firms finance investment by selling conventional bonds then $S_1$ is given by (10):

$$(10)\quad S_1 = (1+e_1+u)f(k_1) - (1+r)k_1,$$

so $V_1$ is given by equation (11)

$$(11)\quad V_1 = f(k_1) - (1+r)k_1 - g(\sigma_e^2+\sigma_u^2)f^2(k_1).$$

$V_1$ is maximized when the first order condition (12) holds :

$$(12)\quad f'(k_1) = (1+r)/\{1 - 2g(\sigma_e^2+\sigma_u^2)f(k_1)\} > 1+r.$$

Thus, in this framework, the LMF invests less than is socially optimal. If the LMF is financed with industry performance bonds it invests more but still less than is socially optimal (LMFs and

conventional firms are assumed otherwise identical in the model). If there are risk neutral investors or if risk is industry specific and diversifiable, the expected return on industry performance bonds will be given by r.

It is optimal for LMFs to sell enough industry performance bonds to hedge all firm non-specific risk, so the expected payment is $F(L_1,K_1)$ and the risk neutral investor(s) are willing to pay $F(L_1,K_1/(1+r)$. The LMF invests $K_1$ and saves the remainder. $S_1$ is given by equation (13):

$$(13)\quad S_1 = (1 + e_1 + u)f(k_1) - (1+u)f(k_1) + f(k_1) - (1+r)k_1$$

which is easily simplified to equation (14)

$$(14)\quad S_1 = (1+e_1)f(k_1) - (1+r)k_1$$

Clearly, since the LMF bears only firm specific risk it will invest more than it would if it were financed with conventional bonds. But since it must bear some risk, it will still underinvest given the existence of risk neutral investors.

More formally $V_1$ is given by equation (15):

$$(15)\quad V_1 = f(k_1) - (1+r)k_1 - g\sigma_e^2 f'(k_1),$$

which is maximized when the first order condition 16 holds

$$(16)\quad f'(k_1) = (1+r)/(1 - 2g\sigma_e^2 f(k_1))$$

Investment is still less than socially optimal but is higher than it would be if the firm were financed with conventional bonds. If all risk is firm-nonspecific industry average performance bonds will guarantee LMF members a riskless income and socially optimal capital labour ratios (indicating that these bonds are optimal debt/insurance instruments).

If employee owned firms are required to sell only enough industry performance bonds to finance their investment, they will have to bear some of the non firm specific risk as well. This will cause them to invest less than if not restricted but more than if they financed investment with conventional bonds.

In contrast if LMFs sold some simple performance bonds, (McCain, 1977), they would avoid bearing some of the firm specific risk. Even risk neutral investors would consider the inefficient effort and other moral hazard problems caused by their bearing some of firm specific risk. Therefore the members of the firm would have to bear the cost of the inefficiency. Nonetheless, selling some simple performance bonds would reduce the risk they bear and increase the optimal capital labour ratio. If the firm sold enough simple performance bonds to avoid all firm specific risk, members would have no incentive to work at all, which would presumably cause the value of the bonds to collapse to zero. This demonstrates by contradiction that LMFs must bear at least some firm specific risk.

Industry performance bonds enable LMFs to avoid bearing firm non-specific risk. Because of potential moral hazard problems LMFs must bear some firm specific risk. This may cause inefficiently low investment and directly reduce the desirability

of membership in the firm. Any efficiency advantages of LMFs including possible non-pecuniary amenities might or might not outweigh this cost; presumably the balance of benefits will depend on such factors as the degree of risk, the optimal capitalization per worker, the optimal labour force size, and the extent of LMF productivity advantages (for a survey see Blinder, 1990).

## IV. Uncertainty Resolved Before Employment Decisions Are Made

In this section we consider an alternative scenario in which K but not L is chosen in period zero.

For simplicity, we initially assume that there is no firm-specific risk. Now, p is revealed in period one, it is the same for all firms in the industry, and then L is chosen and goods are produced and sold at p, indexed bonds are redeemed for the contract payment and conventional bonds are redeemed for their face value. Investors are assumed to be risk neutral or alternatively it is assumed that the risk in pQ is industry specific and completely diversifiable.

The labour-managed firms attempt to maximize the share of revenues to each member, s:

$$17)\quad s_i = \frac{pQ_i - B_i - pQD_i}{L_i} = \frac{pL_i^{a}K_i^{1-a} - B_i - pQD_i}{L_i}$$

where Q is value added, B is the number of conventional bonds sold by the LMF and D is the number of industry average performance bonds sold by the LMF.

In period zero the LMF faces a budget constraint, they can buy capital only by issuing bonds and so:

18) $K_1 - B_1/(1+r) - D_1/((1+r)_0(pQ)) <= 0,$

where $_0(pQ)$ is the expected value of pQ at time zero.

To solve the model with indexed bonds we will assume that LMFs with access to appropriate indexed bonds will hedge all risk and will make the same employment and output decisions as conventional firms (this will be confirmed only at the end of the analysis.) To see how they might do this we will analyze the employment decisions and profits of a conventional firm with the production function described above. Given these results we will calculate the output and membership decision of a labour-managed firm which has hedged all risk and which has the aims and constraints described above. First we will guess which values of K, B and D are chosen by the LMF. We will calculate $L_1$ as a function of p, then s as a function of p, then we will confirm that our guesses for K, B and D maximize the expected utility of members of the LMF.

Since we assume constant returns to scale we can solve only for the ratio of B, D and eventually Q and L to K. In a partial equilibrium model we can't solve for K. It is determined in general equilibrium since p, r and the alternative opportunities of potential members are endogenous. We will express all quantities as multiples of K. Again, the required expected return on K is r since it only lasts for one period and since investors are risk neutral (or the risk is diversifiable).

In period one the LMF faces a labour market constraint. If it hires new members the share per worker must be equally valuable as the alternative opportunities of the new members. We will assume that new members are willing to join if the share is greater than or equal to w.[5] In some of the analysis that follows we will assume that conventional firms can hire workers for w and that there are conventional firms with the same production function as LMFs. This implies that counter to the arguments above LMFs have no efficiency advantage over conventional firms deriving from the non-pecuniary amenity of working for an LMF or from increased productivity. This means that the best that the LMF can provide for members is a safe income of w. New members demand at least w and investors demand the same return from money lent to LMFs as for money lent to conventional firms or from equity in conventional firms (recall we assume investors are risk neutral or that industry risk is diversifiable). If expected pure profits could be obtained by conventional firms they would expand until r and w were driven up or the distribution of p was driven down. This means that the expected income of LMF members can not be greater than w. Since they are risk averse they can do no better than guarantee this income without risk.

In particular LMF members can not gain more desirable financial results than they could get as employees of conventional firms. We demonstrate that they can reproduce such safe incomes using indexed bonds for example industry average performance bonds. This means that even a weak desire to work for an LMF is sufficient to cause workers to found them.

Since LMFs will attempt to mimic the behavior of conventional firms we analyze the period two employment decision of conventional firms first. We assume the capital stock is chosen in period zero, calculate employment as a function of p and calculate pure profits (which must have expected value zero) as a function of p.

Given constant returns to scale and perfect competition the capital stock does not matter, all other variables will be calculated as a function of the capital stock. The first order condition for profit maximizing is that the marginal revenue product of labour is equal to the wage so $L_1$ is given by equation (19):

19) $L_1 = K_1(ap/w)^{1/(1-a)}$

Equation (19) implies that nominal value added is given by equation (20):

20) $pQ_1 = p^{1/(1-a)}(a/w)^{a/(1-a)}K_1$

subtracting $wL_1$ and dividing by $K_1$ gives the return per unit of capital. The expected return must be equal to 1+r or risk neutral investors would expand (or contract) output in the firm until prices changed. This implies equation five where expectations are taken at time zero

21) $1+r = E\{(1-a)p^{1/(1-a)}(a/w)^{a/(1-a)}\}$

In particular note that equation five holds only in expectations. Since firms must make investment decisions before p is revealed they earn returns greater than 1+r when $p^{(1/1-a)}$ is greater than its expected value and vice versa.

This has direct implications for LMFs. Employees of conventional firms earn w by assumption. Consider an LMF which financed its investment entirely with conventional bonds. Returns on capital greater than 1+r imply rents which must be shared with new members (which would distort employment decisions). Returns on capital less than 1+r imply that the LMF could not pay each member w. This means that no new members could be attracted and the original members of the LMF would have to bear the loss (made much greater by the inefficiently low employment level). This unattractive prospect could explain the rareness of LMFs. In particular the possibility that new members might be difficult to attract makes the problem of risk bearing much greater.

Price risk generates pure economic profits which cause problems for LMFs. The LMF could use indexed bonds to hedge such profits. Such pure profits are value added minus the wage bill minus the user cost of the capital employed and are given by (22):

22) $$\text{pure profits} = pQ_i - wL_i - (1+r)K_i = \{(1-a)p_{1/(1-a)} - (1-a)E(p^{1/(1-a)})\}(a/w)^{a/(1-a)}$$

If the LMF financed its investment with conventional bonds and imitated the hiring decisions of a conventional firm the

difference between the share of each member and w would be pure profits divided by $L_1$.

If instead the LMF could sell indexed bonds and buy conventional bonds so that all pure profits were obtained by investors the share of each member would be w if it imitated the hiring decisions of a conventional firm. The profits and losses from producing and selling goods would be canceled by the losses and profits on its speculative portfolio.

Indeed given such financial decisions in the first period, the LMF would make the same hiring decisions as a conventional firm. That is it would admit as many workers as members as a conventional firm would hire. The reason is simple. A conventional firm chooses L to maximize value added minus wL. A hedged LMF which imitates the hiring decisions of a conventional firm has value added plus speculative gains (or losses) equal to $wL_1$. Any other choice of $L_1$ would give lower value added minus wL. This means that value added plus speculative gains (or losses) would be less than $wL_1$ so the share per member would be less than w so the LMF would imitate the hiring decisions of a conventional firm.

Two questions remain. First how could an LMF sell all pure profits to investors that is how could it hedge price risk. Second would it choose to do so. The answer to the first question is given by equation six. An LMF could sell all pure profits by selling conventional bonds to buy its capital then selling $(1-a)K(a/w)^{a/(1-a)}$ bonds which each of which paid $p^{1/(1-a)}$ and investing the proceeds in conventional bonds. In fact it is somewhat simpler than this since risk neutral investors (or

investors who new that risk in p was industry specific) would pay exactly K for this quantity of bonds indexed to $p^{1/(1-a)}$. This means that an LMF is hedged if it finances its investment with such bonds and neither buys nor sells conventional bonds.

The solution described in the paragraph above is not very elegant. A rather neater and more easily implemented strategy is to use bonds indexed to the value added of a conventional firm. Recall that nominal value added is proportional to $p^{1/(1-a)}$. This means that bonds linked to nominal value added by a conventional firm have the same distribution as bonds linked to $p_{1/(1-a)}$ and therefore the same distribution as pure profits. If an LMF financed its investment with bonds indexed to value added by a conventional firm it would be hedged.

Since we have assumed that all firms in the industry have the same production function and face the same prices all conventional firms in the industry would produce the same value added (as a multiple of their capital). This means that a bond indexed to the average value added by all conventional firms in the industry could equally be used by LMFs to hedge their risk.

Finally since hedged LMFs make the same employment and output decisions as conventional firms value bonds indexed to value added by hedged LMFs could be used by an LMF to hedge risk. This means that if LMFs are hedged they can use bonds indexed to value added in the entire industry to hedge risk so they will be hedged. This argument is as circular as all arguments about economic equilibria. It implies that an outcome of a game in which LMFs finance their investment with industry average performance bonds and neither buy nor sell conventional bonds is

that they make the same employment decisions when prices are revealed as conventional firms and pay each of their members the market wage w with certainty.

The second question asked above is given the availability of financial instruments which makes it possible for LMFs to hedge risk will they choose to do so. The answer is yes. The grim consequences of neglecting to do so were described informally above. More formally the argument is that LMF members can not do better than provide themselves with a guaranteed income of w without earning expected pure profits and the assumptions of our model make that impossible. If the LMF members i buy capital stock $K_i$ they must sell financial instruments worth $K_i$ to sophisticated risk neutral investors. This means that the expected payments of those assets are $(1+r)K_i$. Note that this must be true even if the members are allowed to declare bankruptcy and avoid paying their debts. The probability of bankruptcy will be considered by investors when deciding how much to pay for the financial instruments. Expected profit maximizing conventional firms guarantee that the expected return on capital can not be greater than 1+r. This means that the expected value of value added minus (1+r)K must equal the expected value of $wL_i$ or, as shown by equation (23):

$$23)\quad E(pQ_i) - (1+r)K_i = E(wL_i)$$

New members will not join the LMF unless they are paid at least w so if $LN_i$ is the number of new members and $LF_i$ is the number of

members equation (24) holds

$$24) \quad \frac{E(pQ_i) - (1+r)K_i - E(wLN_i)}{LF_i} \leq w$$

Equation (24) states that the expected income of members of the LMF is less than or equal to w. Since the members are risk averse they can do no better for themselves financially than to guarantee themselves an income of w with certainty. They can do this by hedging all risk with industry average performance bonds (or the other assets described above).[6] If they are rational they will do so.

To sum up, in this section we have made three arguments -- inefficient short run employment decisions by LMFs are made because of pure economic profits which current members do not want to share with new members, such pure profits can be avoided if investment is financed with industry average performance bonds and the LMF neither buys nor sells conventional bonds and finally that it is in the private economic interests of members of LMFs to finance investment in this way.

The results described above are in striking contrast to those obtained for LMFs which finance investment from their members resources or by conventional fixed interest bonds or loans. Previous authors have noted that share maximizing LMFs financed by conventional means will respond to changes in the price of the good they produce by reducing employment and output (Ward, 1958). This strange behavior has a simple explanation -- a high price of output implies high quasi rents e.g. pure

profits. Current members of share maximizing LMFs are disinclined to share these rents with outsiders. Therefore they reduce output and employment (membership). This problem is avoided in the model described above because LMFs can and (if rational) will sell indexed bonds and with them the rights to such rents (pure profits) to outside investors.

## V Conclusions

In this paper we have argued that a serious problem with financing employee owned or labour managed firms with standard performance bonds is that workers would have an incentive to make investments which do not add to value added but which do increase workers utilities, or simply to shirk. For conventionally owned firms, these problems can be limited by shareholders' legal authority and especially by the threat of takeovers. To avoid such problems, we have suggested an asset which bears some of the risk which is out of the control of workers, but which makes payments which they cannot affect. In particular, we argued that Industry-Average Performance Bonds paying a share of value added in the industry have favourable characteristics. Each bond would pay a fixed share of value added by other firms in the same industry. It would be bought at the market rate. Since the payment depends only on the value added by other firms in the same industry, workers would have no interest in reducing their liability by reducing value added. This asset would enable investors to sell insurance against general and industry specific risk to fully LMFs. The analysis appears to also have some applicability to family-run and start up businesses where owners do not wish to relinquish management control.

Use of the index bonds developed in the paper would mitigate the well-known perverse supply responses of such firms by reducing the variance of economic rent, but only to the extent that risk is industry-wide. LMFs might also face firm-specific risk. It is necessary for members to bear at least some of the firm-specific risk since LMF specific outcomes depend on their

choices. Since they bear LMF specific risk LMFs will earn pure profits (rents). Their response to LMF specific shocks will differ from the efficient response of an idealized conventional firm. Depending on the extent to which they hedge LMF specific risk (which can not be completely hedged) their response may even be perversely signed. Nonetheless industry average performance bonds (or the other indexed bonds described above) have an important additional advantage since LMFs with access to them respond efficiently to industry wide shocks.

In introducing a new type of financial instrument, or any innovation in economic organization, the question inevitably arises: "if this is so good, why doesn't it already exist?" In other words, though the defect is not apparent, the fact that the instrument is not in use "reveals" to us that there must be a hidden flaw. But new forms of financial instrument are in fact frequently introduced; as economic conditions change, new types of economic organization become suitable. In this case, it is worth recalling that employee ownership has only recently become a large factor in the economy; and that the dearth of LMFs in the past has limited the potential profitability of innovations in that market. There are frequently increasing returns to scale in the financial sector. Sometimes, one would hope, economic analysis can itself lead to innovations of value to the economy.

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## Endnotes

1. During the first half of 1989, $19 billion were spent by US corporations to acquire their own stock to establish ESOPs. This compares with $5.6 billion for all of 1988 and under $1.5 billion from 1974 through 1987 (Scholes and Wolfson, 1990). Preliminary evidence suggests that this trend is continuing through 1991.

2. See, e.g., "A Model for East Bloc Workers: Employee Ownership," L.A. Times, June 12, 1990, p.03. "Up for Grabs: State Industries," Wall Street Journal, May 21, 1990. "East Europe for Sale," The Economist, April 14, 1990, p. 19.

3. An alternative form of the asset would depend on the average of dividends paid by publicly owned firms in the same industry. A limitation of this approach is that it depends on the presence of a sufficiently large number of publicly held conventional firms in the relevant industry to provide a benchmark. In fact it would only work if the amount of the dividend-based asset issued by LMFs were low. If a substantial value of such assets were issued, conventional firms would have an incentive to increase the dividends paid on their shares. If their shareholders also held the new assets this would be a way of serving their shareholders' interests. In any case defunding competitors is always tempting. The dividend-based asset can at most be used so long as the needs of LMFs for capital and risk arbitrage are low.

4. For simplicity we assume that default risk is negligible. Since bonds are indexed to value added this is relatively plausible.

5. If the alternative utility is less than the market wage w then the LMF can share negative rents among an expanded number of members. It may be shown that for constraints close to w it is rational for them to do so by overhedging price risk and by increasing output more in response to a price increase than would even a conventional firm.

6. Selling (1-a) of value added will achieve this result for a Cobb-Douglas production function. Note that this implies that investors are receiving the conventional competitive share of capital in every realized state. In general, rents can be eliminated by selling bonds indexed to the share of capital of conventional firms.

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